

Byzantine Chant Theory and Practice in the Light of Ancient Greek Music Theory and Occicentrism

by *Amine Beyhom Foredofo*

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Byzantine Chant Theory and Practice in the Light of Ancient Greek Music Theory and Occicentrism¹

Amine Beyhom

“The Pythagoreans’ opinion that the planets and the stars, while following their course, produce sounds which combine harmonically is erroneous. In Physics, it is proven that their hypothesis is impossible, that the movement of heavenly bodies can generate no sound at all. Nearly everything that concerns music theory is a product of the Art, and foreign to Nature”

Shaykh Abū-n-Naṣr al-Fārābī,² *The Great Book of Music*

Abstract: Ancient Greek music theory comprises a large body of speculations which are not necessarily related to how music practice was really carried out at the time. This complex set of theories was reduced by 19th-20th centuries scholars to a *ditonic* – as for two whole tones in a Just fourth – substrate for many reasons, the first of which being the legitimization of Western music and its alleged Ancient Greek affiliation. The same biased Hellenistic tool was used to influence Byzantine chant in the late 19th century (2nd Patriarchal Reform) in such a way as to modify both its theory and praxis, pulling it away from its “Eastern” sources. The article demonstrates that today, more than ever, the future – and the preservation – of Byzantine chant is closely dependent on a better understanding of its intrinsic characteristics, far from the ideological speculations – and political considerations – of the last few centuries.

¹ This article is based on the paper presented on September 7, 2017, at the *Modus-Modi-Modality* conference held at the European University of Cyprus – Nicosia, and titled “Ancient Greek music theory as an analytical tool for Occicentrism”. Tonogram analyses were performed with Praat (<http://www.praat.org/>). Additional score notations were produced with MUS2 (<http://www.mus2.com.tr/en/>)

² In Rodolphe (d’) Erlanger, *La Musique Arabe*, 6 Tomes – I. [*Al-Fārābī*] (1930). II. [*Al-Fārābī et Ibn Sīnā*] (1935). III. [*Commentaires Sur Le Livre Des Cycles de Saḥiyy-a-d-Dīn Al-Urmawī*] (1938). IV. [*Anon. – a-Sh-Shirwānī – et Al-Lādhīqī*] (1939). V. [*Échelles et Modes*] (1949). VI. [*Rythmes et Formes*] (1959) (Paris: Librairie orientaliste Paul Geuthner, 1930), 28. Al-Fārābī (or “Alfarabius”), an Arabian polymath of the 9th to 10th centuries, was also surnamed “The Second Teacher” (to Aristotle).

The article is based on the book of the author on Arabian Byzantine chant (see <http://foredofico.org/CERMAA/archives/584>) and on his further research on Hellenism in musicology, notably the dossier for NEMO-Online No. 5 (see <http://nemo-online.org/wp-content/uploads/2016/11/INTERNET-5-04.-Article-NEMO-n%C2%B05-Amine-Beyhom-161130-S.pdf>) and other articles on modality (see <http://foredofico.org/CERMAA/publications/publications-on-the-site/publications-amine-beyhom>).

Keywords: Ancient Greek music, Byzantine chant, Hellenism, Occidentism, Byzantinism, Orientalism, maqam, microintervals.

Introduction

Western musicology was driven, in the 19th and 20th centuries, to the absolute necessity of integrating Byzantine chant (even forcibly) in the European pseudo-neo-Hellenistic realm – as an inclusive process – and of excluding other *maqām* musics, in their present forms, from the evolutionary scheme of history, deeming them “backwards” – as an exclusive process. The aim of this massive procedure was (and still is) the rooting of the European-Western culture in Ancient Greece and the continued legitimation of Western sciences and arts.

In music (and musicology) this necessitated on the one hand the prior legitimation of Western diatonism – from here on “ditonism”³ – through the re-reading of Ancient Greek music theories and, on the other hand, the exclusion of “Oriental” characteristics from those theories and from the “Byzantine Chant of the Origins”.

If we research the representation of Greek theories in musicological literature, the chronology and classifications of Music history in the 19th and 20th centuries (and today), and lastly the tools used for the analysis of “Oriental” musics (including Byzantine chant), a general scheme of the Orientalism/Hellenism process can be drawn, with a

³ The author uses the terms “ditonism” and “ditonic” – as for two whole tones in a Just fourth – for the sake of differentiation between the Western (or “Tense”) diatonic, which is a particular case of diatonism, and other shades of diatonism in music.

relatively simple pattern.⁴ This process led to consequences which suited the (*exclusive/inclusive*) aims of the Orientalism/Hellenism procedure.⁵

The present article focuses on two main points: (1) Greek *genos* theories, their implementation (and their justification) in Western musicological literature, followed by the refutation of these justifications; (2) the inclusive process for Byzantine chant and the process of Re-Byzantinism – the counterpart of Re-Orientalism for Arabian music. It relies partly on auditory examples integrated in a series of video-animated slides which notably explain the role of heterophony in Byzantine chant and how this process interferes with musicological explanations.⁶

Greek *genos* theories and their implementation (and justification) in Western musicological literature

Three concepts of music predominate in Ancient Greek literature: (1) The Pythagorean doctrine – which is based on elementary mathematics and frequency ratios; (2) The Aristoxenian pragmatic approach – which is often misinterpreted as an equal-temperament division of the octave – based on “the Senses”; and (3) the Harmonicists’ close-packed diagrams and equal-divisions of the interval space(s) to describe scales – with “28 quarter-tones” in an octave.⁷

⁴ See Amine Beyhom, “Dossier: Hellenism as an Analytical Tool for Occidentism (in Musicology) (V2),”, *Near Eastern Musicology Online* 3, no. 5 (November 2016), 53–275, [http://nemo-online.org/wp-content/uploads/2017/02/\(V2-INTERNET\)%205-04.%20Article%20NEMO%20n%C2%B05%20Amine%20Beyhom%20170219S.pdf](http://nemo-online.org/wp-content/uploads/2017/02/(V2-INTERNET)%205-04.%20Article%20NEMO%20n%C2%B05%20Amine%20Beyhom%20170219S.pdf).

⁵ Detailed explanations about the relation between Hellenism and Orientalism are available in the aforementioned dossier of the author notably for Music history, in Chapter II (Beyhom, 81–94.)

⁶ These are referred to in the article as “VSxx” for single slides videos – with “xx” standing for the number of the slide – or “VSxx-yy” for videos embodying thematically more than one slide – with “xx” referring to the number of the first slide in the series and “yy” to the number of the last one.

⁷ While the “Modern”, “Arabian” octave comprises (6 tones =) 24 quarter-tones, the concept of the “28 quarter[-tone]s” in the octave can be easily compared to the pre-Modern Arabian “28-quarter-tones-per-one-octave” scale which, at least in some aspects, is similar to the Harmonicists’ concept of the scale – see part one in the English language article Amine Beyhom, “Kashf Al-Asrār ‘an Karkarat Al-Aḥbār Fī Ta’wīl Al-Adwār كشف الأسرار عن كركرة الأحبار في تأويل الأدوار”, *Near Eastern Musicology Online* 1, no. 1 (November 2012): 67–88, <http://nemo-online.org/wp-content/uploads/2016/12/INTERNET-06.-Article-NEMO-n%C2%B01-1-Amine-Beyhom-Reissue-201612S.pdf>.

These three main theoretical developments survive in music theory today, notably in theories of *maqām* music (as well as in Byzantine chant) for Aristoxenos' conception, and in theories of Turkish (and Byzantine) music of the 20th and 21st centuries – as a particular synthesis of Pythagorean and Harmonicists' theories.

A definite tendency in last centuries musicology regarding *genos* (and scale) theory was the restriction of the concept of Diatonism to the semi-tonal equivalent of Mainstream classical – then World – music. However, there exists an infinity of *genē* in Ancient Greek music theory, as the definitions of “diatonism”, “chromaticism” and “enharmonism” relied not on definite measures of the intervals,⁸ but on boundaries for intervals determining *categories* for *genē*. Within these boundaries, a *genos* would be considered as belonging to one of the three aforementioned categories.

The example of diatonism is, by itself, already enlightening (see Fig. 1 and VS01). Figure 1 proposes no less than six formulations of the diatonic tetrachord⁹ by various – Pythagorean¹⁰ – theoreticians, only one of whose version corresponds to the “Western” diatonic – or ditonic: namely that of Eratosthenos (8/9, 8/9, 243/256 – second from the left) which is also known as “Tense diatonic”.

⁸ Measuring an interval, except through a ratio of string lengths, would have been very difficult, if not impossible, in that period.

⁹ The audio reproductions of these six formulations are available in VS01.

¹⁰ It is always useful to remind that Pythagoras as such may have never wrote about music, and that attributions to this philosopher must be handled cautiously (see Carl Huffman, “Pythagoras,” in *Stanford Encyclopedia of Philosophy*, 2006, <http://plato.stanford.edu/entries/pythagoras/>; “Pythagoreanism,” in *Stanford Encyclopedia of Philosophy*, 2006, <http://plato.stanford.edu/entries/pythagoreanism/>).

Figure 1

Diatonic tetrachords in Ancient Greek literature on music, with intervals in (string lengths) ratios and cents: the bottom row in the table following attests for the use of these tetrachords by either (or both) al-Fārābī (Alfarabius – “Fārābī”) and Ibn Sīnā (Avicenna – “Sīnā”) and specifies – if different – the formulation (position of the intervals – between brackets) they used to express these tetrachords (Watch VS01)

Theoretician	Archytas	Eratosthenos	Didymus	Ptolemaeus		
Type	diatonic (P. “middle” or “tonic”)	diatonic	diatonic	diatonic: “soft”	diatonic: “syntonic” or “tense”	diatonic: equal
1 st ratio	8/9	8/9	8/9	7/8	9/10	9/10
cents	204	204	204	231	182	182
2 nd ratio	7/8	8/9	9/10	9/10	8/9	10/11
cents	231	204	182	182	204	165
3 rd ratio	27/28	243/256	15/16	20/21	15/16	11/12
cents	63	90	112	84	112	151
Sum	498	498	498	498	498	498
Stated by	Fārābī, Sīnā (7/8, 8/9, 27/28)	Fārābī and Sīnā	Fārābī, Sīnā (9/10, 8/9, 15/16)	Fārābī and Sīnā	Fārābī (2 1st intervals inverted), Sīnā	Fārābī

All these formulations sound more or less familiar and as belonging to the same “family” (category), and all – except Eratosthenos’ – “deviate” from the Western norm, and more so for Ptolemaios’ formulation of the “equal diatonic” tetrachord (9/10, 10/11, 11/12 – first on the rightmost part of the table). The latter tetrachord corresponds to the Arabian *rāst* which¹¹ is the cornerstone of Arabian – also defined as *zalzalian*¹² – music today.¹³

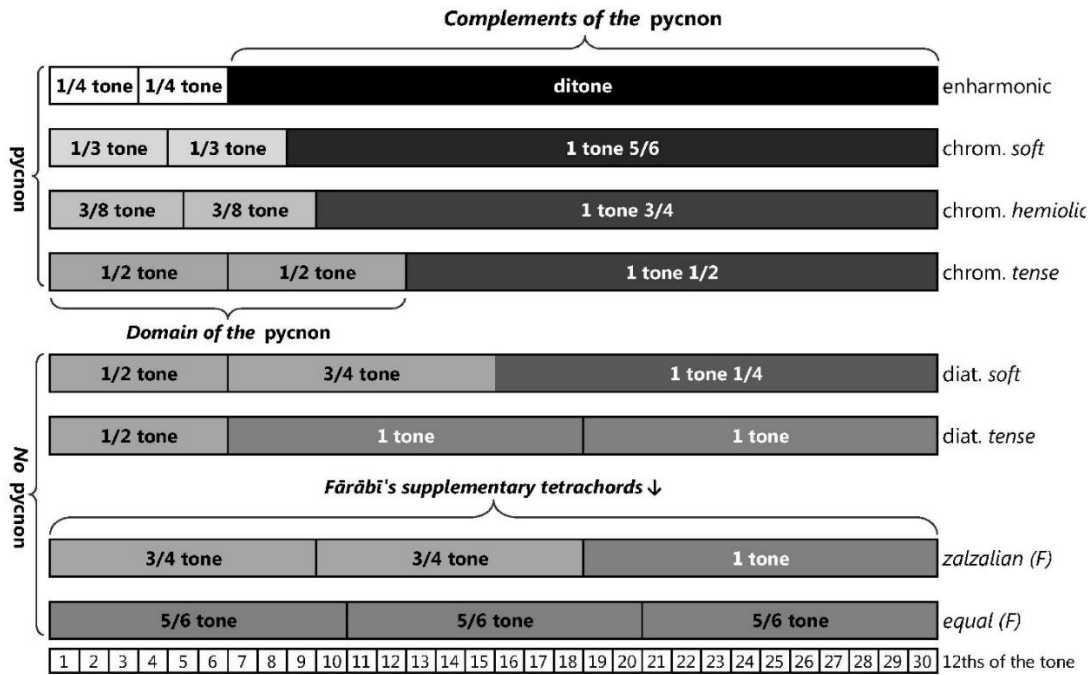
¹¹ Together with tetrachord *bayāt* which holds similar intervals but in another – inverted – succession (11/12, 10/11, 9/10).

¹² “Zalzalian” is a term used in contemporary musicology – notably of *maqām* or Arabian music – to characterize scalar elements (intervals, tetrachords, scales, etc.) and formulaic melodic entities (*genē*, modes, etc.) which do not comply with the semi-tonal norm. An overall simplification of the concept would consider scales or *genē* comprising intervals expressible as odd multiples of the quarter-tone as “zalzalian”. In the above example of *genos rāst* (or the “equal diatonic” tetrachord of Ptolemaios), the successive intervals can be approximated as – ascending – 4 (quarter-tones), 3 (quarter-tones) and 3 (quarter-tones). For *genos bayāt* these intervals would be inverted: 3 3 4. For more explanations about the differences between tetrachord and *genos*, scale and mode, etc. see Amine Beyhom, “Un lexique de la modalité,” *Near Eastern Musicology Online* 2, no. 2 (November 2013), 5–24, <http://nemo-online.org/wp-content/uploads/2016/12/INTERNET-2-01.-Article-NEMO-n%C2%B02-2-Lexique-Amine-Beyhom-Reissue-201612S.pdf>.

Aristoxenos' *typical* tetrachords are another example (Fig. 2 and VS02) of diverse declensions for chromaticism and diatonism – also known to Arabian theoreticians such as al-Fārābī, who supplemented the diatonic tetrachords with two variants.¹⁴

Figure 2

Aristoxenos' typical tetrachords with al-Farabi's diatonic addenda (Watch VS02)



"A Hypothesis for the Elaboration of Heptatonic Scales," *Near Eastern Musicology Online* 4, no. 6 (November 2017), 5–89, <http://nemo-online.org/wp-content/uploads/2017/05/INTERNET-6-01.-Article-NEMO-no.-4-6-1-Amine-Beyhom-Hypothesis-170501.pdf>.

¹³ Note that theoreticians of the Golden Age of Arabian civilization – such as al-Fārābī and Ibn Sīnā (Avicennius) – mastered Greek theories of the scales and proposed variants of the *genē* expounded in Ancient Greek manuscripts.

¹⁴ Note in Figure 2 that the "zalzalian" tetrachord added by Fārābī is the equivalent of aforementioned tetrachord *bayāt*. As for the – quantitatively – "equal" diatonic of this theoretician (below), it certainly has a peculiar flavor (listen to the corresponding audio in VS02) but is (still) not theorized in today's Arabian music.

While Aristoxenos expressly states that there exists an infinity of tetrachords with intermediate intervals in between the boundaries of diatonism, chromaticism and enharmonism,¹⁵ music theoreticians in the last centuries often wondered at the small differences between – for example – the third-of-a-tone interval of the *soft chromatic* tetrachord and the three-eighths-of-a-tone interval used in the *hemiolic chromatic* tetrachord,¹⁶ a mere 8 cents difference.¹⁷ They were thus forgetting that the typical *genē* of Aristoxenos (the upper 6 in Fig. 2) are proposed for the sake of demonstration, on one side, and that one of the aims of Aristoxenos was to counter Pythagorean thought in music – which he knew intimately,¹⁸ on the other. This is the reason behind the choice of these particular values for the intervals of his tetrachords, as they are based on the well-known Pythagorean *tetrad* 1 2 3 4 (Fig. 3).

Whenever this process (1) relates to theoretical considerations and (2) explains the use of the 3/8 tone interval – as half of the 3/4-tone *pyncnon* – for the *chromatic hemiolic* tetrachord, it implies a subtle, but implicit use of Pythagorean arithmetics by Aristoxenos.¹⁹

¹⁵ See for example Thomas J Mathiesen, *Apollo's Lyre: Greek Music and Music Theory in Antiquity and the Middle Ages* (Nebraska - EU: University of Nebraska Press, 1999), 332–33.

¹⁶ For an example of such misunderstanding in musicological literature, see Samuel Baud-Bovy, “Le ‘Genre Enharmonique’ a-t-il Existé?,” *Revue de Musicologie* 72, no. 1 (January 1, 1986), 12, <https://doi.org/10.2307/928769>, and explanations in Beyhom, “Hellenism as an Analytical Tool,” 65.

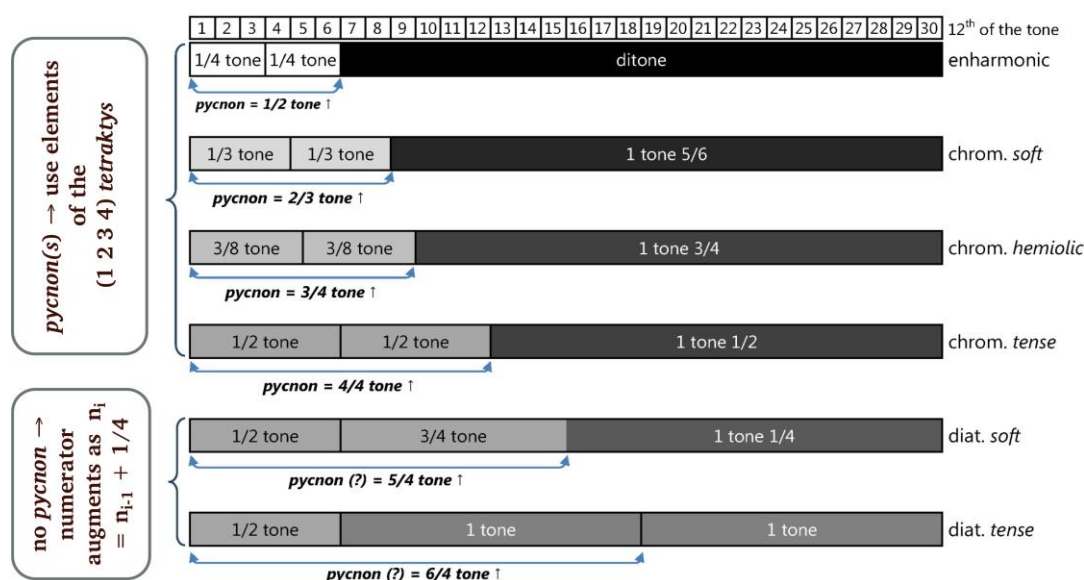
¹⁷ The difference between the third of the tone and three-eighths of a tone is equal to 200 (cents) for one whole tone – based on an equal-temperament division of the octave – multiplied by $(3/8 - 1/3)$ which gives in full 8 cents. Such small differences were used as a justification by musicologists to discard all but the “normative” tetrachords expounded in Fig. 4.

¹⁸ Aristoxenos even wrote a biography of Pythagoras – see Reinach’s commentary in (Plutarch) Plutarque (0046?-0120?), *De la Musique / Plutarque*, ed. Henri Weil (1818-1909) and Théodore Reinach (1860-1928) (Paris: Ernest Leroux, 1900), xvi, <http://gallica.bnf.fr/ark:/12148/bpt6k486063k>.

¹⁹ Knowing Aristoxenos’ declared opposition to the Pythagoreans (as well as to the Harmonicists), his use of their mathematics would have to be concealed. (For a comprehensive review of Ancient Greek music theories and theoreticians, see Mathiesen, *Apollo's Lyre*).

Figure 3

The progression of the values of the pycnydium (and following non-pycnon di-intervallic combinations of the lower two intervals) in Aristoxenian tetrachords, with values respectively equating $1/2$ (the ratio of the octave), $2/3$ (the ratio of the Pythagorean fifth), $3/4$ (the ratio of the Pythagorean fourth) and $4/4$ ($1/s1$ – the ratio of the unison) fractions of the tone, in a superparticular progression applied not to the ratios, but to the values of the pycnidium in a perfect application of the Pythagorean tetrad. The progression continues evenly ($5/4$, $6/4$) for the “lower” intervals of the non-pycnon (diatonic) genē.



Most importantly, however, the urge of Western musicology to justify ditonism led musicologists to oversimplify all these possible declinations and merely keep the variants which were compatible with the Western norm (Fig. 4 and VS03), namely the “tense” diatonic and chromatic²⁰ tetrachords to which was added – generally as a trifling technical curiosity – the enharmonic tetrachord with two quarter-tones forming the *pycnon*.²¹

²⁰ Note that the tense chromatic tetrachord is rarely used in the usual Greek theoretical progression (i.e. half-tone, half-tone, one-and-a-half tones) in music, be it Western or not; its typical use implies displacing the $1\frac{1}{2}$ tones interval to the center of the tetrachord. In Arabian and *maqām* music, this corresponds to the tempered (“piano” in the video-slide) tetrachord *ḥijāz*.

²¹ The *pycnon* is the group of two smaller intervals in the chromatic and enharmonic tetrachords. The diatonic tetrachords have – by definition – no *pycnon* as the sum of the two smallest intervals is greater than – or equal to – the third interval.

Figure 4

Western over-simplified representation of Ancient Greek tetrachords (Watch VS03)

	Lower register		Higher register	
	Hypate			Nete
<i>diatonic</i>	$\frac{1}{2}$ tone		1 tone	1 tone
<i>chromatic</i>	$\frac{1}{2}$ tone	$\frac{1}{2}$ tone	1 $\frac{1}{2}$ tones	
<i>enharmonic</i>	$\frac{1}{4}$ tone	$\frac{1}{4}$ tone	2 tones	

The reason for such a generalized simplification is evident as, when confronted to “Foreign” musics during the Great Expansion of the 18th-19th centuries, Western musicology had to justify the exclusive use of the restricted semi-tonal substrate by its music. On the other hand, this musicology aimed at rooting its music in Ancient Greece in order to legitimize an evolutionary scheme of history²² consecrating the Western nations as the pinnacle of this process.

Three main propositions (pro-Neo-Hellenistic arguments) were mainly used for those purposes in musicology:

- Firstly, Ancient Greek music is not oriental²³ (but “enharmonism” is oriental)
- Secondly, anything else than ditonism (or tense chromaticism) is too subtle to be correctly heard, or too difficult to perform effectively

²² Influenced by both Darwinian and Spencerian thoughts.

²³ For example, in Maurice Emmanuel, “Grèce,” in *Encyclopédie de la musique et dictionnaire du conservatoire – Première partie: Histoire de la musique*, ed. Albert Lavignac (Paris: Delagrave, 1921), 383, <http://gallica.bnf.fr/ark:/12148/bpt6k1237270>: “Whenever it is true that Apollo came from the banks of the Nile and that Orpheus brought Phrygian Art to the Occident, Dorians, who established [“did”] Greece, shook these opposite influences [from Egypt and Asia] off. Their vigorous race has, up till its end, drawn from its teachers’ fruitful lessons, but it has never accepted to live under their yoke. Thus educated, it escaped [these influences] and submitted traditions from far away to new laws, and adapted to its own taste all alien musics. Greece has thus given itself its own music, whose principles it maintained unchanged for five or six centuries, and that it handed down, through the Romans, to Medieval artists” – Note also the stress on the continuity between the music of Ancient Greece and Western music in this quote, which “necessarily” leads to the exclusion of “Oriental” characteristics from Ancient Greek music.

- As a corollary to this proposition, enharmonism and other non-ditonic forms are unattractive, difficult (impossible to sing, especially for choir music), if not “perverted” music²⁴
- Lastly, ditonism is better than other possibilities in Greek music and represents the highest stage of evolution for this music
 - Fétis’ corollary says that ditonism, being “natural”, must have predated all other forms of music.²⁵

While such statements are inconsistent, mostly ideological *and* conflicting one another, they are nonetheless the basis on which musicology was built in the 19th century, and which still directs musicological thought today. This makes it indispensable to thoroughly scrutinize such statements – and refute them.

Refutation of neo-Hellenistic arguments in musicology

Firstly, “Ancient Greek music” is a synonym for “Ancient Mediterranean music”, explained by Ancient Greek-speaking theoreticians and performed and variously influenced, locally or from neighboring realms, for at least one millennium.²⁶ Moreover,

²⁴ For example, in Reinach’s formulation for his introduction of Plutarch’s *De Musica* in 1900 (Plutarque (0046?-0120?), *De la Musique / Plutarque*, xvi–xvii): “The introduction, in the threnody, of these small intervals, [which are] impossible to identify exactly or to sing, seems to be due to the influence of Oriental music, in which these are still in use today in the form of *glissandi*; the Greeks, being concerned with reason and subtle thinkers, wanted to apply precise rules and a mathematical evaluation for these “transitional sounds”; they were attracted by the very difficulty of the perception and the performance of these intervals. But this was only, in reality, a perversion of [good] taste and the 4th-century reaction against the enharmonic *genos* marks the comeback of the real Greek genius, *i.e.* European”.

²⁵ François-Joseph Fétis, *Histoire générale de la musique depuis les temps les plus anciens jusqu’à nos jours*, vol. 3 (Paris: Firmin Didot, 1869), 90: “Some will be probably surprised to see that I reverse the order adopted by Greek theoreticians and Modern music historians alike: they have all dealt with the diatonic *genos* first, then with the chromatic and, finally, with the enharmonic (or harmonic). I choose the reverse order [...] because [...] incomplete scales and the use of quarter-tones, *i.e.* enharmony, were the basis of the most Ancient populations of Asia Minor and Greece, therefore, complete scales, composed of tones and semitones or, in other terms, the diatonic order disposed in a regular system, was the last stage of progress for tonality, for one cannot refuse to admit that the imperfections of enharmony are the beginning, and [that] the diatonic *genos* [is] the conclusion”.

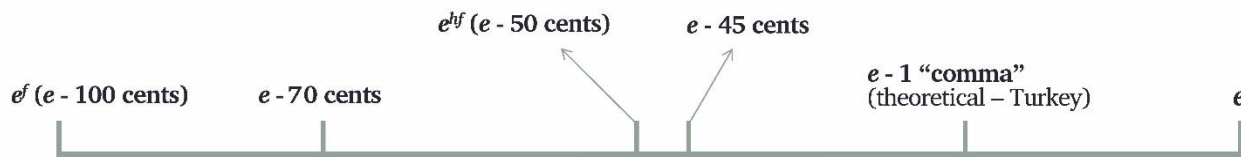
²⁶ See Jon Solomon, “Towards a History of Tonoï,” *The Journal of Musicology* 3, no. 3 (1984), 242, 243, 244, notably: “At the outset let me attempt to clarify why we do not have and could never have a completely unified, consistent, coherent accounting of ancient Greek music and music theory [...] ‘Ancient Greek music’ encompasses over 1200 years or more of different musics and 700 years or more of different musical theories. Complicating the matter further is what has been traditionally understood to be a lack of

micro-tonality (“enharmonism”) is a main constituent of these musics, at least today in practice and in Ancient times’ theory – because we have no recordings of the praxis of music in those times.²⁷

While the preceding statements need not be further proved, it is easy to demonstrate – as a first approach – that micro-intonational inflections can be easily heard by trained – or culturally apt – ears (Fig. 5 and VS04). In Figure 5 the vertical space between two – relative – adjacent pitches e^f (e flat = $e - 100$ cents) and e is scattered with intermediate pitches “ $e - 70$ cents”, e^{hf} ($e - 50$ cents, or e half-flat), “ $e - 45$ cents” (a mere 5 cents difference with the preceding pitch) and “ $e - 1$ comma” which corresponds to the theoretical lowered e in most today’s Turkish theories of music.

Figure 5

Micro-Tonality: listening to successive pitches between e^{flat} and e (Watch VS04)



Listening to the pitches in succession, notably at a fast pace, may at first seem difficult for listeners not used to micro-intonational subtleties to differentiate, for example, $e - 70$ cents from $e - 50$ cents (e^{hf}). However, a thorough listening to e^{hf} ($e - 50$ cents) and $e - 45$ cents in succession easily allows to differentiate both pitches, *quod erat demonstrandum*.

In current *maqām* practice,²⁸ such very small inflexions are mostly used – mainly in vocal music – as variations of the same pitch. When paying attention, nevertheless, such small

interchange between those who made ancient music and those who wrote about it [...] the correspondence between ancient Greek music and ancient Greek theory seems to be far from total, and this must be attributed for the most part to the first two factors described above, namely, that we are dealing with theoreticians and musicians who geographically span the entire Mediterranean basin from Ptolemy’s Alexandria to Aristoxenos’ Italy to Nicomachus’ Gerasa and who temporally span a period from the time of Homer’s predecessors to the time of Boethius—more than one millennium”.

²⁷ If we replace the terms “Greek-speaking” by the terms “Arabic-speaking” in the above statement, we get a perfect definition of Arabian music in the Golden – and post-Golden – Age(s).

intonational changes are clearly distinguishable by ear, and all the argumentation about the impossibility of distinguishing them falls apart, especially because renowned performers of *maqām* music rely on such changes to either clearly modulate, or simply enrich the melody.²⁹ This is also the case for well-trained Byzantine cantors, were they Greek or Levantine.³⁰

While interval differentiation – when the difference between intervals and scales are clear to both performer and listener – is the realm of modulation in melodic music, small intervallic variations with no scale modification are a core characteristic of modality, notably in Byzantine chant.

Heterophony in Byzantine chant

Between 2010 and 2012 I have recorded, for my book on Byzantine chant,³¹ four experienced Byzantine Choir directors (and soloists) and asked them (notably) to chant the scales of the eight canonical modes.

I found serious disparities between the four performances, as well as between the praxis of each cantor *and* theory.

As a consequence, the main question that arose while trying to analyze these recordings was: How to reconcile these different performances, on the one hand, *and* theory and praxis, on the other?

To answer this question, I devised an experiment with the recordings I possessed, namely with recordings of the scale of the first mode, described in the theoretical literature as “diatonic”.

The composition of the scale of the first mode according to the theory of the Second Reform of Byzantine chant in the 19th century (Fig. 6, and VS05-09 for this figure and the

²⁸ I use here the term “*maqām* music” as a generic denomination for the traditional musics of the Middle-East and Central Asia regions – including notably Byzantine chant.

²⁹ A few video-analyses of *maqām* performances, showing such great mastery in intonational variations of the melody, are proposed at <http://foredofico.org/CERMAA/analyses/maqam-analysis>.

³⁰ A series of video-analyses of performances by both Greek and Lebanese Byzantine chant cantors are available at <http://foredofico.org/CERMAA/analyses/byzantine-chant>.

³¹ Amine Beyhom, *Théories et pratiques de l'échelle dans le chant byzantin arabe : Une approche comparative et analytique proposant une solution inédite pour le système théorique de Chrysanthos le Madyte* (Broummana [Liban]: Par l'auteur, 2015).

two following), is “ $\pi\alpha \uparrow 10\ 8\ 12\ 12\ 10\ 8\ 12$, $\Pi\alpha \downarrow 12\ 12\ 6\ 12\ 12\ 8\ 10$ ”.³² I extracted the first two notes $\pi\alpha$ and $\beta\upsilon\upsilon$ ³³ (theoretically equivalent to d and $e^{-2\text{ moria}}$) and aligned them one after the other, then analyzed them separately with Praat. The results are shown in Figure 7.

Figure 6

Scale of the 1st mode (Western/Byzantine notation) in Byzantine chant according to the theory of the Second Reform of the 19th century. Accidentals in the Key signature lower the degree by two “minutes” which is the equivalent of a sixth of a tempered whole-tone (Slide No. 5 in VS05-09)



As can be easily seen in the figure, none of the intervals between the pairs of $\pi\alpha_{\beta\upsilon\upsilon}$ ³⁴ pitches is exactly equal to the theoretical 10 “minutes” of Byzantine chant theory (listen to the computerized version in Slide No. 5 of VS05-09), nor are they equal to one another. They have considerable differences in the styles, attacks of the notes and general form of the pitch outline which is confirmed by the thorough listening to the 4 successive pairs of pitches (Slide No. 6) and becomes even clearer when listening to the same in half-tempo (Slide No. 7).

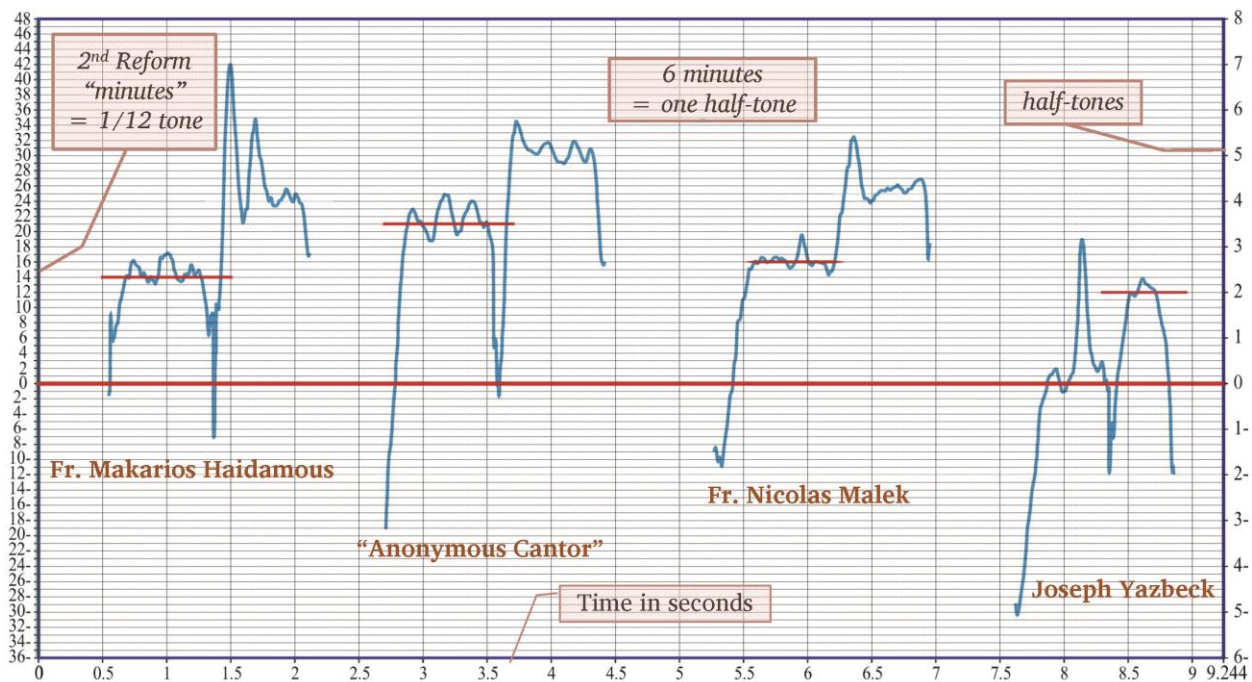
³² Arrows show the (ascending or descending) direction of the scale. The first note is $\pi\alpha = d$ followed in the ascending direction by successive intervals of 10, 8, 12, 12, 10, 8 and 12 *moria* or “minutes”, which are equivalent to one twelfth of a tempered tone each. In comparison with the Western semi-tonal scale of Common practice, e and b are lowered by two minutes each while ascending, whenever b is flat when descending. This corresponds, in Arabian *maqām* music, to the scale(s) of *maqām Bayāt*.

³³ The Byzantine solmization is $\pi\alpha\ \beta\upsilon\upsilon\ \gamma\alpha\ \delta\iota\ \kappa\epsilon\ \zeta\omega\ \nu\eta\ \Pi\alpha$ (the capital letter differentiates here octave pitches for the degree $\pi\alpha$).

³⁴ The lower hyphen in $\pi\alpha_{\beta\upsilon\upsilon}$ is used as a convention to indicate an interval.

Figure 7

Four initial $\pi\alpha_\beta\upsilon\upsilon$ intervals of the scale of the 1st Byzantine mode, by four different Lebanese cantors of Byzantine chant, analyzed with Praat. From left to right: Fr. Makarios Haidamous, an anonymous cantor, Fr. Nicolas Malek and Joseph Yazbeck. Graduations to the left are in Byzantine chant “minutes” (one twelfth of a tempered tone), and to the right in numbers of half-tones. Horizontal bottom axis shows the time in seconds. (Slides Nos. 6 and 7 in VS05-09)

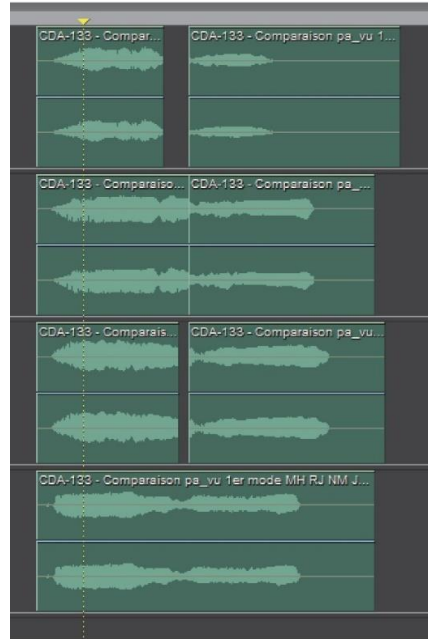


Trying to answer the initial question about the compatibility of these discrepancies between the performances of these very experienced choir directors and soloists, I tried to recreate the conditions of a Byzantine choir as the ones I have been researching in Lebanon over the last decade (Slide No. 8):

1. Firstly, I transposed three of the four pairs of pitches (intervals) to the same (lowest) tonic, approximated by ear
2. I slightly then displaced (adjusted) the pitches to align them (approximately) (Fig. 8)
3. Finally, I added some reverberation to emulate the acoustics of a cathedral

Figure 8

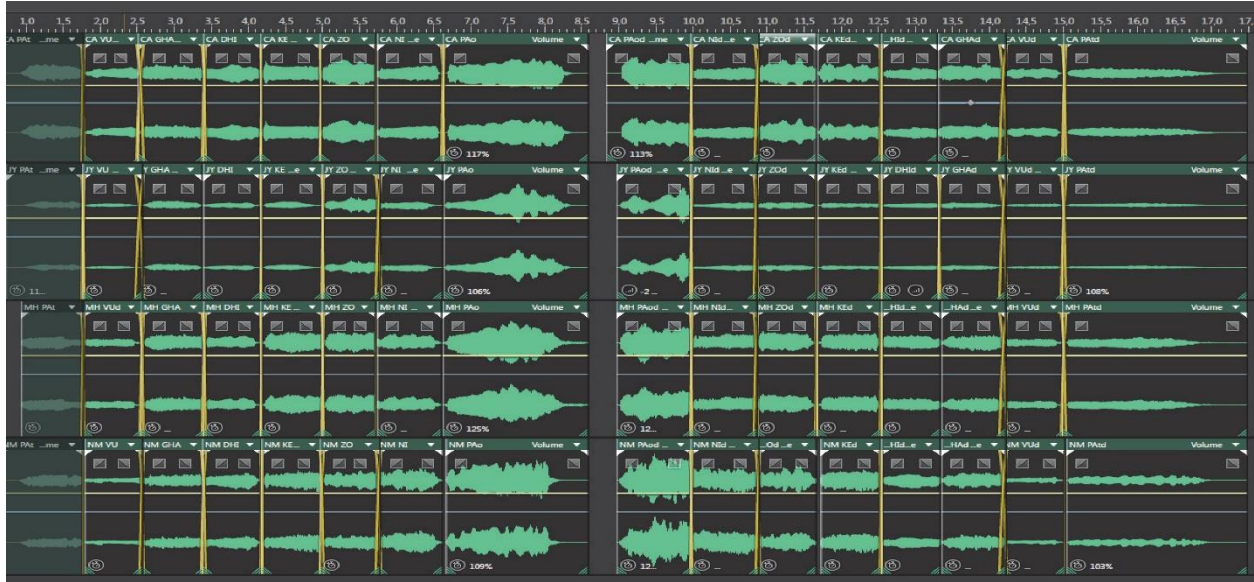
Adjusted (slightly displaced) pitches of the four $\pi\alpha$ – $\beta\upsilon\upsilon$ pairs ready for mixing (Slide No. 8 in VS05-09)



Eventually, I followed a similar procedure for the whole ascending and descending scales of the four cantors. (Fig. 9 and Slide No. 9)

Figure 9

The four ascending and descending scales with displaced pitches, ready for the mix
(Slide No. 9 in VS05-09)



The final (audio) result was very convincing and explained how Byzantine choirs operate in praxis, with singers of one choir rehearsing and approximately adjusting together pitches and rhythm to create a common sound, thickened by the small discrepancies in both rhythm and pitch. These discrepancies become then necessary to the plenitude (completeness) of the resulting chant by creating a “density” of the resulting sound.

Thus, Byzantine Choir music shows that micro-tonality and choir singing are not only compatible, but also a desirable phenomenon. The environment in which Byzantine chant is performed also plays a major role: the reverberation – a natural phenomenon in (Byzantine) churches and cathedrals – contributes to the levelling of the differences between performers and to the blending of the different voices in one common sound. This is the essence of choir heterophony, notably in Byzantine chant. A corollary to this observation is that heterophony and polyphony are independent of scales (intervals) and intonation, but also that the aesthetics of Byzantine chant are very different from today’s Western aesthetics of sound.

However, and while choir heterophony gives a convincing explanation about the discrepancies between cantors (singers in a choir) *in praxis*, this still does not answer the question about the above selected – and accented – differences between praxis and theory.

The answer to this question can be generic and simple: (scale) theory is an intellectual way of codifying practice which should describe it as thoroughly as possible, but not impose on it. This applies particularly to traditional musics, as theory in these cases is always an *a posteriori* over-simplification of practice, and should be used only as a guide for performers, and not as a binding straightjacket.

To give a (further) tangible example of the discrepancies between theory and practice in Byzantine chant I propose the graphic analysis of the incipit of a chant sung by Georgios Tsetis in the First mode – in the so-called New Sticheraric style (Fig. 10 and VS10-12). While the first interval of the *apechema* is somewhat smaller than the theoretical value of 12 *moria* (between $N\eta$ and $\pi\alpha$ ³⁵ in the First Mode – approximately at 2.8 seconds and from -1.6 to 0 semi-tones), the pitch of the tonic $\pi\alpha$ – “0” semi-tones per convention on the vertical axis to the left – rises (beautifully) for approximately one semi-tone between 6 seconds and 8.5 seconds on the graph.

The intonations of the incipit (from 10 to 24 seconds on the graphic) are very complex: a thorough examination of the first 4 seconds of this incipit (from 10 to 14 seconds – Fig. 11 and Slides Nos. 11 and 12) shows variations of one-quarter-tone (the attack of the first note at approximately 10.5 seconds) and various semi-tone and three-quarter-tones intervals which structure the melody, regardless of the theoretical values of the intervals.

³⁵ C and d: I use a change of capitalization of the initial letter of a Byzantine chant note to show a passage to the next octave.

Figure 10

Graphic analysis of the apechema (0-9s) and of the incipit from Track 10 on *Σύμμεικτα ἐκκλησιαστικῆς μουσικῆς 2 – Μεγάλη Τεσσαρακοστή* (Αθήνα: Κέντρον Ἑρευνῶν καὶ Ἑκδόσεων, 1999), performed by Georgios Tsetsis in the 1st mode (New Sticheraric style)
– Slide No. 10 in VS10-12

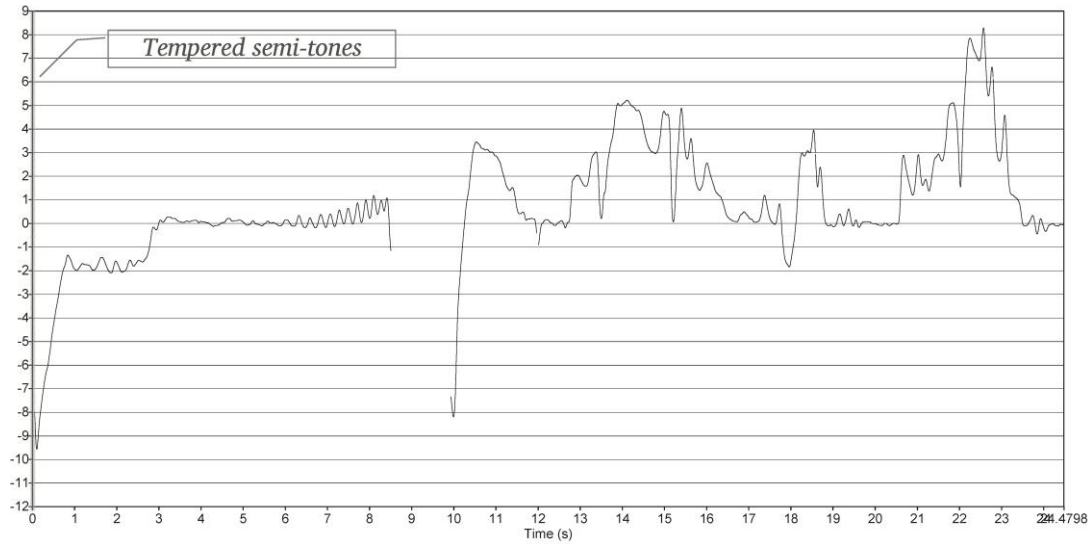
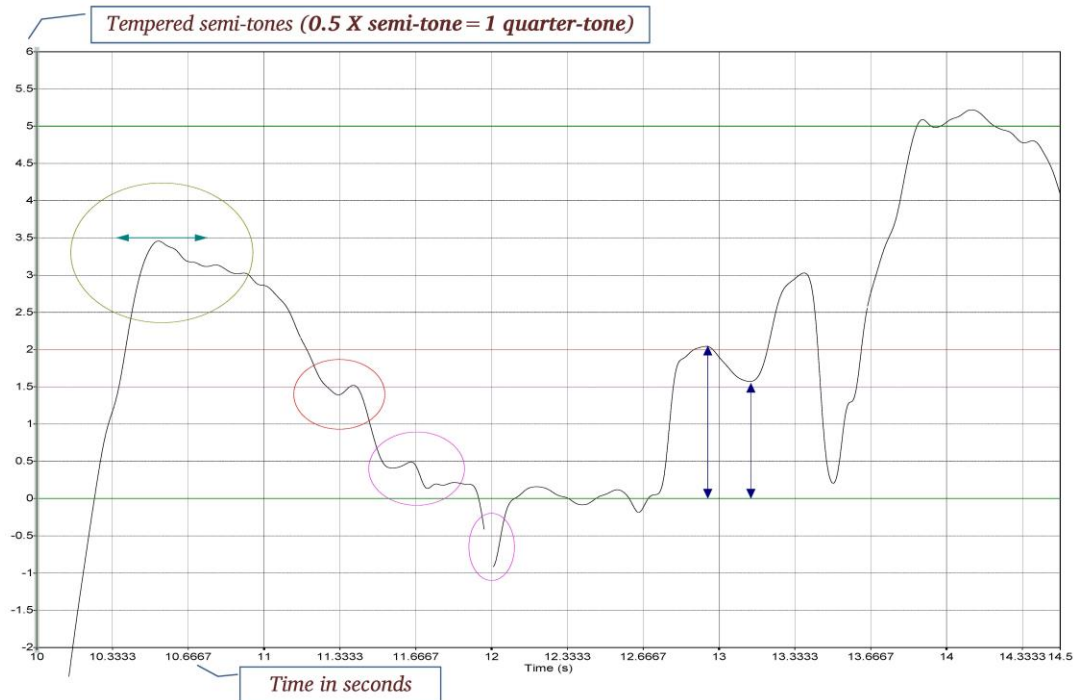


Figure 11

Graphic analysis with Praat of the first 4 seconds of the incipit (Slides Nos. 11 and 12 in VS10-12)



This abundance – and mastery – of intonational changes with soloists, together with the operating mode of Choral heterophony, contradict the theory of the scale put forward by the Second 19th-Century Patriarchal reform and is a testimony to the superiority of modal practice over various theories of the scale. This also shows the complete divorce between the Pythagorean scale theory based on mathematics and praxis,³⁶ and that commentaries and statements by Western musicologists of the 19th and early 20th centuries were mostly biased, auditory-blind and erroneous – notably when applied to Byzantine chant.

Occidental (musical?) culture has appropriated Ancient Greek culture and tailored it to its needs, distorting it when necessary to impose the ditonic scale as the predominant characteristic of European musical identity, while examples of non-ditonism abounding in Folk European music were mostly deemed insignificant (for these musicologists).³⁷

The consequence of this process was the tendency to interpret European traditional music in the light of pseudo-Greek (or “Ecclesiastical”) modes, with ditonic axioms – along with the denial of generalized diatonism – which prevented scholars from correctly understanding and analyzing their own traditional music. It is as if it was not the truth about the nature of music that mattered, but the confirmation that the Tonal (Occidental, Classical) model remains predominant, if not undisputed.

Byzantinism

As for Byzantine chant, it was seen by Western musicologist in a very unique way, due to a series of factors, notably the desire to make (Ancient) Greece out to be the cradle of European civilization which conflicted with the “Eastern” characteristics of not only Byzantine chant, but also of Greek folk music. If we add to this first factor the fact that Byzantium as such was equally deemed “Eastern”,³⁸ and as a third factor the conflicting relation of the Byzantine Church – and notably of the Ecumenical Patriarchate (of

³⁶ Pythagoreans themselves preferred in practice non-Pythagorean intervals – see the discussion between Soterichos (*i.e.* Aristoxenos) and Lysias (Pythagoras) in Plutarch, *Peri Mousikēs*, ed. Rudolph Westphal, trans. Rudolf Westphal (Breslau: F. E. C. Leuckart, 1865), 101–5, <http://archive.org/details/ploutarchouperi00westgoog>.

³⁷ Examples of non-tempered, non-ditonic music abound in European traditional music, be it for the Scottish bagpipes or Breton singing, or for East-European countries. In the case of the latter, the tendency was, as for Ancient Greek music – and for Byzantine chant – to attribute non-ditonism to the influence of “Oriental” – or Turkish – music.

³⁸ Understand “Oriental”.

Constantinople) – with the Church (patriarchate) of Rome, the result was a denial campaign launched by Western scholars against Byzantium.³⁹

While Byzantine chant was deemed – till its 20th-century expression – “Oriental” music by Westerners and Greeks alike, it was, unlike Arabian – equally “Oriental” – music, the expression of a Christian music and liturgy and was connected, through the *Oktōēchos*, with Gregorian chant. Most of all, however, and in the eyes of Philhellenes of the 19th and 20th centuries, Byzantine chant was Greek – that is it had to be ideal (Western), which left only one option to Western musicologists: it *had* to be “reinstated” in Europe.⁴⁰

The growing influence of European nations in the 19th century catalyzed two successive reforms both of which took place in the 19th-century Byzantine chant: The First Reform (1814-1821), spearheaded by Chrysanthos (of) Madytos, (mainly) simplified the notation and adopted the 17-intervals (×4), an a-symmetrical division of the scale of Ṣafiyy a-d-Dīn al-Urmawī for Byzantine chant.⁴¹ The Second Reform (1881) modified the scale of Chrysanthos, giving it a more Western-compatible – symmetrical – form, notably by using exact half-tones and by dividing the octave into equal parts – two procedures which reconcile the theories of Byzantine chant with Western theories of the scale, and that Chrysanthos avoided in his theoretical formulations.

³⁹ It seems that this campaign has started with Gibbon who thought, “like all typical educated Englishmen in the 18th century, that Byzantium was the betrayal of all the greatest features in Greek and Roman antiquity” – John Julius Norwich, *Histoire de Byzance: 330-1453* (Perrin, 1999), 11. Gibbon’s main work remains *The History of the Decline and Fall of the Roman Empire*, originally published 1776–1788, in which he notably writes (Edward Gibbon, *The History of the Decline and Fall of the Roman Empire*, vol. IX [New York: Thomas Y. Crowell & Co, 1872], 372): “the Greeks of Constantinople, after purging away the impurities of their vulgar speech, acquired the free use of their ancient language, the most happy composition of human art, and a familiar knowledge of the sublime masters who had pleased or instructed the first of nations. But these advantages only tend to aggravate the reproach and shame of a degenerate people. They held in their lifeless hands the riches of their fathers, without inheriting the spirit which had created and improved that sacred patrimony: they read, they praised, they compiled, but their languid souls seemed alike incapable of thought and action. In the revolution of ten centuries, not a single discovery was made to exalt the dignity or promote the happiness of mankind”.

⁴⁰ Besides the factors listed above, another factor is that Byzantine musical tradition relied in particular on a complex diastemic (*i.e. differential*, intervallic, and graphically non-proportional) notation and that Byzantine chant, together with Greek popular music and chant, was considered as the main vector of Greek musical identity.

⁴¹ The scale of Ṣafiyy a-d-Dīn al-Urmawī – a music theoretician of the 13th-14th centuries – is a further elaboration of [al-] Fārābī’s and [ibn] Sīnā’s scales in the 10th-11th centuries. Its use and refinement by Chrysanthos for his scales is expounded at length in Beyhom, *Théories et pratiques de l’échelle dans le chant byzantin arabe*, and partially in Beyhom, “Hellenism as an Analytical Tool”, 128–36.

While it would be burdensome to unwind in this short article the complete process which led to the two reforms and their characteristics,⁴² one particular example of the implementation of this process is enlightening: The interventionism of Louis-Albert Bourgault-Ducoudray (missioned by the French government to study Byzantine chant in the 1870s), and his influence on Germanos Aphtonidēs,⁴³ the (future) president of the Music Committee established by the Ecumenical patriarchate for the Second Reform (1881).

Bourgault-Ducoudray, who met, among other prominent actors, Ilias Tantalidēs and Germanos Aphtonidēs, tried to convince the latter to harmonize Byzantine chant and played him a few attempts. He writes:

*"This experiment proved to me that one and the same person can understand and feel both Byzantine chant and European music, something that I thought until then impossible. It should not be inferred from this fact an argument in favor of the conservation of Byzantine art as is. General opinion in the Orient is that a musical reform has become a necessity."*⁴⁴

We may wonder in whose "general opinion" a reform was necessary? In the eyes of Western musicians? Of the Phanariots? While the answer to this question seems evident,⁴⁵ Bourgault-Ducoudray eventually delivered a synthesis of his views on the future of Byzantine chant:

*"We have already described the state of decadence in which Greek ecclesiastic music has fallen, concerning both theory and praxis. We think nevertheless that it would not be wise to destroy this music",*⁴⁶

adding:

"Although we found an analogy between the diatonic shades known in Antiquity [...] and Modern accidentals in Ecclesiastic music, we do not think that these accidentals be a

⁴² This was already thoroughly expounded in Beyhom, "Hellenism as an Analytical Tool", with further explanations to be proposed in the planned book of the author on Orientalism in musicology.

⁴³ Most information about the role of Bourgault-Ducoudray and his influence on Aphtonidēs is available in Samuel Baud-Bovy, "Bourgault-Ducoudray et La Musique Grecque Ecclésiastique et Profane," *Revue de Musicologie* 68, no. 1/2 (January 1, 1982): 153–63, <https://doi.org/10.2307/928286> (in French), and expounded further in Beyhom, "Hellenism as an Analytical Tool", 136–40.

⁴⁴ Louis-Albert Bourgault-Ducoudray, *Souvenirs d'une mission musicale en Grèce et en Orient* (Paris: Hachette, 1878), 21.

⁴⁵ The answer to this question, if not evident to the reader, is detailed in the aforementioned Beyhom, "Hellenism as an Analytical Tool" and Beyhom, *Théories et pratiques de l'échelle dans le chant byzantin arabe*.

⁴⁶ Louis-Albert Bourgault-Ducoudray, *Études sur la musique ecclésiastique grecque : mission musicale en Grèce et en Orient – janvier-mai 1875* (Paris: Hachette et Cie, 1877), 65.

spontaneous emanation of Greek genius, but must find their origin in Asian influence [...]. We would think with repugnance that Greece could be driven by the natural inclination of its genius to adopt, for the intervals of its music, a principle which is completely alien to the musical sense of other European nations, and be thus condemned to intellectual isolation from the European Mainstream",⁴⁷

or *quod erat demonstrandum*.

This process of forcible inclusion of Byzantine chant (and Greece) within the modern European realm, thus fabricating an *a posteriori* identity for them, is what I name Byzantinism – or the *inclusive* Orientalism process applied to Byzantine chant.

The most obvious consequence of this process was the Second 19th-Century Reform of Byzantine chant with a scale which became Western-compatible, while retaining some “Oriental” characteristics. A corollary consequence was the insistence of mainstream musicologists of Byzantine chant – Tillyard, Wellesz, Gastoué – on the original ditonism of this chant, arguing that Ottoman influence modified it after the Fall of Constantinople (1453).

Whenever it seems much more likely that *Ottoman music* was influenced by Byzantine chant,⁴⁸ the unbridled desire of Mainstream Byzantinologists to enforce ditonism on original Byzantine chant led them to the fabrication – with the help of Mahmoud Ragheb – of the “Byzantine chant organs” which proved, a few decades later, to have never existed.⁴⁹

While this historical fabrication seemed inconclusive to other – more analytically inclined – musicologists such as Oliver Strunk, the latter endeavored to “prove” that only ditonism (“tense” – or Western – diatonism) could have been used in the Byzantine

⁴⁷ Bourgault-Ducoudray, 68–69.

⁴⁸ While this statement will be expounded fully in the author’s forthcoming book on Orientalism in musicology, the following quote is but one among numerous others which witness the influence of Byzantium on the Ottomans: “From the nomadic Turcoman principality that Osman founded in 1280, to the Empire of the Intermediate Region [centered on today’s Greece and Turkey] of Mehmet II as it materialized on the aftermath of the fall of the last Byzantine stronghold, the Empire of Trebizond in 1461, almost two hundred years were needed before the Byzantine political succession fell on the Ottomans. However, at the end of the first centennial, the Byzantinization of the Ottoman state, with Bayezit the First and the sovereigns of the so-called ‘inter-regnum’ period (1402-1413), was already so much advanced that Greek was adopted as the Ottoman administrative language. Without the reaction of their successors, the balance would not have been restored and the succession would have turned into the assimilation of the Turks in the Greek corps” – Dimitri Kitsikis, *L’Empire ottoman* (Paris: Presses universitaires de France, 1985), 37–38. (Translated by the author).

⁴⁹ See ‘Appendix 5: ‘The myth of the organ(s) in Byzantine churches (before “The Fall”)', in Beyhom, “Hellenism as an Analytical Tool”, 224–34.

chant of the pre-Ottoman period. However, his demonstration failed in taking into account generalized diatonism (Fig. 1 and VS01, VS02) or even Byzantine chant “diatonism” as promoted by the two 19th-Century reforms, as his “proof” was solely based on the over-simplified conception of Ancient Greek tetrachords (Fig. 4 and VS03) promoted by Western musicology at that time.

While both *zalzalian* (Fig. 2 and VS02) and Byzantine (First or) Second Reform “diatonism(s)” have been elsewhere⁵⁰ proved to fulfill the conditions for pre-1453 Byzantine chant, the myth of the original ditonism of Byzantine chant, based on one fabrication and on one inconclusive – and biased – analytical demonstration, predominated for decades in the literature and is still widespread today.

The response of local actors of Byzantine chant – be it in Greece or in the Arabian countries – was a typical mix of denial and refusal,⁵¹ on one side, and the use of Western – scientific? – argumentation,⁵² on the other, to either defend their current practice of their music, or to bring it even closer, in both theory and practice, to Western theories of the scale and practice.

One striking example of this process – which I call “Re-Byzantinism” – is Dimitri Giannelos’ explanations on the scale of Byzantine chant in the 1990s.

Re-Byzantinism

In his *La musique byzantine* (“Byzantine Music”)⁵³ Giannelos “reminds” us that “all the intervals [of the Byzantine *diatonic* scale used in the 1990s] are natural” and “that this scale corresponds to the Occidental, Natural scale of Zarlino”.⁵⁴ (Fig. 12 and VS13-14)

⁵⁰ See ‘Appendix 6: ‘On the “Diatonic [ditonic] tonal system” as the prototype system for “Medieval” Byzantine chant’, in Beyhom, “Hellenism as an Analytical Tool,” 235–39.

⁵¹ See for example Gregorios Th. Stathis, “An Analysis of the Sticheron [...] by Germanos, Bishop of New Patras [The Old ‘Synoptic’ and the New ‘Analytical’ Method of Byzantine Notation],” in *Studies in Eastern Chant*, ed. Miloš M. Velimirović, vol. 4 (London & others: Oxford Univ. Press, 1979), 177–227.

⁵² Mainly Pythagoreanism.

⁵³ Dimitrios Giannelos, *La musique byzantine : le chant ecclésiastique grec, sa notation et sa pratique actuelle*, Collection Musique et musicologie, les Dialogues, ISSN 1272-1972 ; 1996 (L’Harmattan, 1996), a redrafted version of his Ph.D. thesis Dimitrios Giannelos, “Musique byzantine : tradition orale et tradition écrite, XVIII^e-XX^e siècles” (3^e cycle Ethnologie, Paris X, 1988). For more details on Giannelos’ handling of Byzantine chant theory and his use of intervals (and Western notation), see Beyhom, *Théories et pratiques de l’échelle dans le chant byzantin arabe*, 30–49.

⁵⁴ Giannelos, *La musique byzantine*, 61.

The intervallic ratios of this scale are given as 9/8, 10/9 and 16/15⁵⁵ for the three “tones” of the *diatonic* scale (see first row in Fig. 12).⁵⁶ While this scale is presented as the scale of the Second Reform⁵⁷ it is obviously not so (compare the lower three rows in Fig. 12) although the numbers of minutes composing its intervals are the same as in the latter theory.

Figure 12

The “Byzantine” diatonic scale according to Giannelos and comparisons⁵⁸ (Slide No. 13 in VS13-14)

	16/15 or 112 c.			16/15 or 112 c.																
<i>Giannelos' formulation</i>	9/8 or 204 c.	10/9 or 182 c.		9/8 or 204 c.	10/9 or 182 c.															
<i>Equivalent 2nd Reform “minutes”</i>	12 or 200 c.	11 or 183 c.	7 or 117 c.	12 or 200 c.	11 or 183 c.	7 or 117 c.														
<i>2nd Reform original formulation in “minutes” and cents equivalents</i>	<div style="display: flex; align-items: center; justify-content: space-between;"> c → ascending scale c </div> <table> <tr> <td>12</td><td>10</td><td>8</td><td>12</td><td>12</td><td>10</td><td>8</td></tr> <tr> <td>200 c.</td><td>167 c.</td><td>133 c.</td><td>200 c.</td><td>200 c.</td><td>167 c.</td><td>133 c.</td></tr> </table>						12	10	8	12	12	10	8	200 c.	167 c.	133 c.	200 c.	200 c.	167 c.	133 c.
12	10	8	12	12	10	8														
200 c.	167 c.	133 c.	200 c.	200 c.	167 c.	133 c.														

For one that thoroughly listens to the two scales, the difference between the third and seventh degrees of the two scales (Slide No. 13 in VS13-14) should not be difficult to perceive.

⁵⁵ With the corresponding values approx. 204, 182 and 112 cents.

⁵⁶ Giannelos, *La musique byzantine*, 59.

⁵⁷ Proposed by the author in the usual progression of the Byzantine *diatonic* scale, the ascending – here on c – 12 10 8 12 12 10 8 (minutes) scale.

⁵⁸ The first row shows frequency ratios as given by Giannelos and values of intervals in cents, the second row gives the closest equivalents in numbers of minutes of the scale of the Second Reform, and the third row gives the canonical numbers of minutes in the latter scale with the last row showing the equivalents of the latter intervals in cents. Interval equivalents are given in the equal-tempered scale for the Second Reform; the logical conclusion is that the scale of Giannelos should be represented with (ascending) 12 11 7 12 12 11 7 minutes (of the Second Reform) intervals.

Furthermore, when comparing Giannelos' and the Second Reform's formulations with the formulation of Chrysanthos (First Reform) and with the Pythagorean ditonic formulation, we can notice – and hear – that the intervals in Giannelos' "Byzantine" (Zarlinian) scale (Fig. 13 and Slide No. 14 – third row) are even closer to the Pythagorean ditonic formulation (fourth row below) than those of the Second Reform (second row), themselves a further westernization of the scale of Chrysanthos (first row).

This is even more obvious when we concentrate on the evolution of the degree $\beta\omicron\upsilon$ (lowered e in the ditonic scale) from one theory to the next – in chronological order. It then becomes clear that Byzantine chant theories are evolving in a straight line towards ditonism.

Figure 13

Evolution of "tones" from Chrysanthos (top) to Giannelos (penultimate row), to be compared with the intervals of the (Pythagorean) ditonic tetrachord (last row): the "mujannab" intervals (the "medium" and "small" tones in Byzantine chant theories, and the "intermediate" tones in Arabian theories of the Golden Age) get closer, with each successive theoretical formulation, to the intervals of Pythagorean ditonism (Slide No. 14 in VS13-14)

Interval	tone		"medium" tone		"small" tone	
	ratio	in cents	ratio	in cents	ratio	in cents
1 st Reform	9 / 8	203.91	12 / 11	150.64	88 / 81	143.50
2 nd Reform	9 / 8	203.91	800 / 729	160.90	27 / 25	133.24
Giannelos	9 / 8	203.91	10 / 9	182.40	16 / 15	111.73
Ditonic	9 / 8	203.91	9 / 8	203.91	256 / 243	90.22

Conclusion

Western music history, which contended itself in previous centuries with a direct filiation with Ancient Greek – then "Roman" – music and strived for the inclusion of "Early Christian Music" leading to European Music of the Middle Ages and, as a climax,

to Johann-Sebastian Bach as the utmost representative of the multi-tempered period,⁵⁹ faced in the 19th century a difficult task; namely that of including all the “new” (or “foreign”) musics of the world in an evolutionary scheme⁶⁰ which would eventually lead, to Western tonal music, and justify its superiority – as well as its own, contradictory evolution towards equal-temperament.

Inclusive Byzantinism and Exclusive Orientalism, which are but two aspects of one ongoing process, used a biased Hellenistic legacy for this purpose, despite its inadequacy in explaining and describing these “foreign” musics.

One of the results of this Orientalist/Byzantinist procedure is that most literature on Byzantine chant and *maqām* music is burdened by Hellenism and Orientalism, and that almost all analytical “research” on music (in general) is biased by the arbitrary, ditonic axioms of musicology.

Today, more than ever, the future of Byzantine chant is closely dependent on a better understanding of its characteristics and its Ancient links to *maqām* music – which it probably influenced at least in what is today called the Middle-East –, far from the ideological speculations – and political considerations – of the last few centuries.

⁵⁹ See Beyhom, “Hellenism as an Analytical Tool”, 81–94.

⁶⁰ See notably Philip V. Bohlman, “The European Discovery of Music in the Islamic World and the ‘Non-Western’ in 19th-Century Music History,” *The Journal of Musicology* 5, no. 2 (April 1, 1987), 160, <http://www.jstor.org/stable/763849>: “History thereby acquired attributes according to an organismic metaphor; historical progress was marked by a response of complex and diverse parts, together constituting a whole. [The] elaborate schemes of classification in all scientific areas [that] followed suit from the work of Charles Darwin and Herbert Spencer. The specific contributions of evolutionary theory to the writing of more comprehensive music history may be more difficult to pinpoint, but I would submit that their entrance into musical scholarship was facilitated by the growing acceptance of non-Western music as inseparable from music history”. See also Ruth A. Solie, “Melody and the Historiography of Music,” *Journal of the History of Ideas* 43, no. 2 (April 1, 1982), 297–98, <https://doi.org/10.2307/2709205>: “Two aspects of the doctrine of evolution loom especially large in the writing of history: first, the progressive development from simple to complex or from homogeneity to heterogeneity as put forth by Herbert Spencer; and second, the growth of the new from the old as each new species displaces its predecessor, according to the writings of Darwin”. Note that Spencer preceded Darwin shortly with his evolution theory, based on the transmission of acquired changes through generations; his contribution to music evolution theory is part of his *Essays* (Herbert Spencer, *Essays: Scientific, Political and Speculative* [London: Longman, Brown, Green, Longmans, & Roberts, 1858]), entitled “The Origin and Function of Music”, in the same reference vol. 1, pp. 359–84.

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Biography: Amine Beyhom is chief editor of NEMO-Online (<http://nemo-online.org/>) and director of the CERMAA (Centre de Recherches sur les Musiques Arabes et Apparentées), a research center affiliated to the FOREDOFICO foundation in Lebanon; he holds a Ph.D. (2003) in music and musicology as well as an *Habilitation à diriger les recherches* (2010) from the Université Paris-Sorbonne in France. He is the author of two books (2010; 2015) the first concerning Arabian theories and music praxis from the 8th to the 13th centuries, and the second on Byzantine chant. He has taught musicology and ethnomusicology in universities in Lebanon and conducted workshops and seminars in France and Tunisia. Amine Beyhom was bestowed in October 2017 the triennial Lois Ibsen Al-Faruqi prize by the Society for Ethnomusicology (see <http://foredofico.org/CERMAA/archives/820>).